

[012] The present invention is based upon the objective of proposing a multi-step transmission of the type stated above, in which the construction effort is optimized and, moreover, the degree of efficiency in the main driving gears is improved with respect to drag and gearing losses. Additionally, low torques are supposed to act on the shifting elements and planetary gear sets in the multi-step transmission of the invention, and the speeds of the shafts, shifting elements, and planetary gear sets are supposed to be kept as low as possible. Furthermore, the number of gears, as well as the transmission ratio spread should be supposed to be increased. ♦♦

[029] Fig. 4 represents a schematic view of a further preferred embodiment of a multi-step transmission of the invention; [[and]] ♦♦

[030] Fig. 5 represents a schematic view of a further preferred embodiment of a multi-step transmission of the invention; ♦♦

Fig. 6 is a diagrammatic view of an embodiment of the multi-step transmission having a differential; ♦♦

Fig. 7 is a diagrammatic view of the multi-step transmission with a clutch element and a prime mover; ♦♦

Fig. 8 is a diagrammatic view of the multi-step transmission located between a starting element and a prime mover; ♦♦

Fig. 9 is a diagrammatic view of the multi-step transmission for a front-transverse installation with a prime mover; ♦♦

Fig. 10 is a diagrammatic view of the multi-step transmission with a prime mover and a damper; ♦♦

Fig. 11 is a diagrammatic view of the multi-step transmission with an auxiliary output for an additional unit; ♦♦

Fig. 12 is a diagrammatic view of the multi-step transmission having a free wheel; ♦♦

Fig. 13 is a diagrammatic view of the multi-step transmission with an electric machine; ♦♦

Fig. 14 is a diagrammatic view of one of the shafts having a retarder; and
Fig. 15 is a diagrammatic view showing the input and the output on the
same side of the transmission housing.

[041] Hereby, an electric machine 40 or an additional suited[[,]] drive source may be arranged on the shaft 0, which was detached by means of the brake 00 (this is diagrammatically shown in Fig. 13).

[042] It is possible, in accordance with the invention, as shown in Fig. 12, to provide a additional free wheel(s) 42 at each suitable position of the multi-step transmission, for example, to be connected between a shaft 66 and the housing G or about two shafts, if need be.

[043] It is possible through the mode of construction of the invention, as shown in Fig. 15, to arrange the input and output on the same side of the transmission or the housing G preferably for transverse, front wheel, longitudinal, rear longitudinal or all-wheel drive arrangements. Moreover, an axle differential 20 and/or an inter-axle differential 20 can be arranged on the input side or on the output side, as shown in Fig. 6.

[044] The input shaft 1 can be separated by a clutch element 24 from a drive motor or a prime mover 30 as needed within the framework of an advantageous further development, as shown in Fig. 7, whereby a hydrodynamic converter, a hydraulic clutch, a dry starting clutch, a wet starting clutch, a magnetic powder clutch or a centrifugal clutch can be used as the clutch element. It is also possible, as shown in Fig. 8, to arrange a starting element 28 of this type behind or downstream of the transmission in the direction of power flow[[,]] whereby, in this case the input shaft 1 is continuously connected with the crankshaft 32 of the motor or prime mover 30, as shown in Fig. 9. According to the invention, the starting procedure can take place using a shifting element of the transmission. Preferably the brake 04, which is activated in the first forward gear, as well as in the first reverse gear, can be used.

- [045] The multi-step transmission of the invention moreover allows for the arrangement of a torsion vibration damper 34 between the motor or the prime mover 30 and transmission, as shown in Fig. 10. ♦♦
- [046] As shown in Fig. 14, a wear-free brake, such as a hydraulic or electric retarder 44 or the like, can be arranged on any shaft, preferably on the input shaft 1 or the output shaft 2, which is especially of significance for use in commercial motor vehicles within the framework of a further, not represented embodiment of the invention. Furthermore, as shown in Fig. 11, an auxiliary output 38 can be provided on any shaft, preferably on the input shaft 1 or the output shaft 2, for driving an additional unit(s) 36 on each shaft. ♦♦
- [048] A further advantage of the multi-step transmission presented here, as shown in Fig. 13 consists in an electric machine 40 being installed on each shaft as a generator and/or as an additional drive machine. ♦♦